

Amendments to the Specification

Please replace the paragraph beginning at page 1, line 4 under the heading of "CROSS REFERENCE TO RELATED U.S. PATENT APPLICATIONS" with the following rewritten paragraph:

--This patent application ~~relates to~~ is a National Phase application claiming the benefit of PCT/CA2004/001990 filed on November 19, 2004; which further claims the priority benefit from U.S. provisional patent application Serial No. 60/523,141 filed on November 19, 2003 in English entitled PERIODIC MESOPOROUS DENDRIMERSILICAS, and U.S. provisional patent application Serial No. 60/614,056 filed on September 30, 2004 in English entitled PERIODIC MESOPOROUS DENDRIMERSILICAS AND DENDRIMER INVERTED OPALS, which are both incorporated herein in their entirety by reference. --

Please replace the following paragraph beginning at page 3, line 16, with the following rewritten paragraph:

--The present invention provides a new material comprising a periodic porous polydendrimer with uniform pores of tunable size. The material may be in powder form, formed as a film or fiber, or as a monolith.--

Please replace the following paragraph beginning at page 3, line 19, with the following rewritten paragraph:

--The porous polydendrimer may be a periodic mesoporous polydendrimer. It may also be ~~either~~ a macroporous polydendrimer. In a preferred embodiment the polydendrimer is a dendrisilica. --

Please replace the following paragraph beginning at page 3, line 22, with the following rewritten paragraph:

--The dendrisilica may be made from any one or a combination of dendrimers. In preferred embodiments the dendrisilica is made from $\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3]_4$ (1), or from $\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{Oi-Pr})_3]_4$ (i-Pr = isopropoxy) (2), or from $\text{Si}[(\text{C}_2\text{H}_4)\text{Si}((\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3)_3]_4$ (3), or from the dendrimer $\text{Si}[(\text{EtO})_3\text{Si}(\text{C}_2\text{H}_4)]_3\text{SiCH}_2\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3]_3$ $[(\text{EtO})_3\text{Si}(\text{C}_2\text{H}_4)]_3\text{SiCH}_2\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3]_3$ (4), or combinations thereof.--

Please replace the following paragraph beginning at page 3, line 27, with the following rewritten paragraph:

--The present invention also provides a method of synthesizing a periodic porous polydendrimer with uniform pores of tunable size, comprising:

mixing a dendrimer with a template under conditions suitable for self-assembly of the dendrimer to form a polydendrimer encapsulating the template; and

removing the template from the polydendrimer to give a periodic porous polydendrimer with uniform pores of tunable size. --

Please replace the following paragraph beginning at page 4, line 2, with the following rewritten paragraph:

--The polydendrimer may be made by polymerization of a dendrimer comprising a polymerizable group at ~~an~~ the outmost shell of the dendrimer, and wherein the polydendrimer self-assembles ~~upon~~ prior to polymerization of the polymerizable group.--

Please replace the following paragraph beginning at page 4, line 6, with the following rewritten paragraph:

--The polydendrimer may be made by polymerization of a mixture of two or more types of dendrimers, each dendrimer of the mixture of two or more dendrimers comprising a polymerizable group at an the outmost shell of each dendrimer. --

Please replace the following paragraph beginning at page 4, line 17, with the following rewritten paragraph:

--The dendrimer may be chosen to give a polydendrimer which is a periodic macroporous dendrisilica. For example, the dendrimer may be $\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3]_4$ (1), or it may be $\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{Oi-Pr})_3]_4$ (i-Pr = isopropoxy) (2), or it may be $\text{Si}[(\text{C}_2\text{H}_4)\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3]_3]_4$ (3), or it may be $[(\text{EtO})_3\text{Si}(\text{C}_2\text{H}_4)]_3\text{SiCH}_2\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3]_3$ $[(\text{EtO})_3\text{Si}(\text{C}_2\text{H}_4)]_3\text{SiCH}_2\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3]_3$ (4).--

Please replace the following paragraph beginning at page 5, line 19, with the following rewritten paragraph:

--Figure 2a) shows powder x-ray diffraction pattern and b) shows ~~TEM images of the powder form of the surfactant-extracted PMeD-1~~ a ^{29}Si MAS NMR spectrum; c) shows ~~^{29}Si MAS NMR spectrum~~ TEM images of the powder form of the surfactant-extracted PMeD-1 and d) shows ^{13}C CP MAS NMR spectrum of the surfactant-extracted PMeD-1; --

Please replace the following paragraph beginning at page 5, line 25, with the following rewritten paragraph:

--Figure 4 shows nitrogen adsorption data for the powder form of the surfactant-extracted PMeD, the diagram shows the type IV N_2 isotherm with its BJH (Barrett Joyner Halenda) analysis of the mesopores (inset); --

Please replace the following paragraph beginning at page 8, line 11, with the following rewritten paragraph:

--The present invention will be exemplified using known dendrimers (1) and (2) and novel dendrimers tetrakis[2-(tris-(triethoxy, 2-ethylsilyl)silyl)ethyl]silane having a formula $\text{Si}[(\text{C}_2\text{H}_4)\text{Si}((\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3)_3]_4$ (3) and bis-[tris-(2-(triethoxysilyl)ethyl)disila disilyl]methane having a formula $\{[(\text{EtO})_3\text{Si}(\text{C}_2\text{H}_4)]_3\}\text{SiCH}_2\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3]_3$ $[(\text{EtO})_3\text{Si}(\text{C}_2\text{H}_4)]_3\text{SiCH}_2\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3]_3$ (4) discussed hereinafter which all use triethoxysilyl groups, however the present invention is not restricted to these as other polymerizable groups may be used in the outermost shell besides those containing silicon. --

Please replace the following paragraph beginning at page 8, line 29, with the following rewritten paragraph:

--The inventors have demonstrated that compound 1 can be co-assembled with a surfactant mesophase in an aqueous solution to create the first periodic mesoporous dendrisilica (PMeD-1). Both powder and oriented film morphologies have been made (using compound 2), and cast monoliths can be expected to form by the application of similar procedures. Also, it has been demonstrated that compound 1 can be infiltrated into a latex colloidal crystal template to create the first periodic macroporous dendrisilica (PMeD). Moreover, the inventors have also shown that the respective second generation dendrimer $\text{Si}[(\text{C}_2\text{H}_4)\text{Si}((\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3)_3]_4$ (3) and a first generation dendrimer with a modified core $\{[(\text{EtO})_3\text{Si}(\text{C}_2\text{H}_4)]_3\}\text{SiCH}_2\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3]_3$ $[(\text{EtO})_3\text{Si}(\text{C}_2\text{H}_4)]_3\text{SiCH}_2\text{Si}[(\text{C}_2\text{H}_4)\text{Si}(\text{OEt})_3]_3$ (4) can be self-assembled in a similar way to give PMeD-2 and PMeD-3.--

Please replace the following paragraph beginning at page 11, line 17, with the following rewritten paragraph:

-- Figure 2a shows the powder x-ray pattern of the surfactant-extracted PMeD-1. The 100 reflection gives a d-spacing of 4.0 nm. Transmission electron microscopy (TEM) images of the PMeD provided additional structural information, showing the presence of periodic arrays of parallel-aligned mesoscale channels with a spacing of 3.9 nm, mesopores of about 2.5 nm and a wall thickness of 2.3 nm (~~Figure 2b~~ Figure 2c). --

Please replace the following paragraph beginning at page 11, line 23, with the following rewritten paragraph:

--The magic angle spinning nuclear magnetic resonance (MAS NMR) spectroscopy of the PMeD showed that no significant Si-C bond cleavage occurred during the synthesis. To expand on this key point, the surfactant-extracted material (~~Figure 2c~~ Figure 2b) shows four peaks at 3.5, 53.8, 61.9 and 71.2 ppm similar to the chemical shifts for the ^{29}Si MAS NMR signals of the precursor 1. The signal at 3.5 ppm can be assigned to the SiC_4 building units of the dendrimer core, while the other signals represent T_1 $\text{SiC}(\text{OSi})(\text{OH})_2$ (53.8 ppm), T_2 $\text{SiC}(\text{OSi})_2(\text{OH})$ (61.9 ppm) and T_3 $\text{SiC}(\text{OSi})_3$ (71.2 ppm) tetrahedral units. The cross polarization (CP) MAS NMR spectroscopy of the PMeD indicates that full removal of the surfactant had occurred by showing a peak at -0.9 ppm, typical for a CH_2CH_2 bridge between two Si atoms.⁷ A small signal at 42.8 ppm indicates some methoxylation of the silanol groups during the extraction process. By comparison all periodic mesoporous organosilicas (PMOs) to date only show $\text{T SiO}_3\text{C}$ ⁸ or $\text{D SiO}_2\text{C}_2$ ⁹ building blocks in their MAS NMR spectra, while the SiC_4 units in PMeDs are unprecedented. --

Please replace the following paragraph beginning at page 12, line 29, with the following rewritten paragraph:

--Nitrogen adsorption data for the powder form of the PMeD-1 shows a diagnostic type IV isotherm with well-defined capillary condensation and very little hysteresis (Figure 4). The Brunauer Emmett Teller (BET) surface area is found to be as high as 1102 m^2/g and the mesopore diameter is about 2.5 nm, calculated by BJH

methods (Figure 4) close to that seen in TEM images (~~Figure 2b~~ Figure 2c). This adsorption data together with the d spacing of 4.0 nm given by PXRD provides an independent estimate of the channel wall thickness of about 1.5 nm thereby corroborating the diameter of the mesopores and thickness of the channel walls obtained by TEM imaging. Density functional theory (DFT) analysis of the low pressure arm of the isotherm also suggests the presence of micropores with diameters in the range of 1.0-1.5 nm, however further work is necessary to confirm this unambiguously.--